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Replacement of whole milk by milk substitute in diet of Brown Swiss calves

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A wide variety of liquid feed sources is available to nourish a calf once it has been fed colostrum for first 2 or 3 days of life. Fresh, frozen or fermented colostrum, whole milk, skim milk and milk replacers are very good liquid feeds for calves.

Economical raising of calves by using milk replacer has received attention to save milk for human consumption (Gampawar and Lanore 1984, Potikanond and Cheva-Isarakul 1984, Jagos *et al.* 1986, Matos *et al.* 1986, Moran *et al.* 1988, Leon and Benezra 1990, Abou-Hussein *et al.* 1991). The present study was undertaken to determine whether the milk replacer gives satisfactory result concerning growth characteristics of the Brown Swiss calves reared in eastern Turkey.

Brown Swiss calves (25 male and 25 female) from the cattle herd of the Research Farm of the Agricultural College at Atatürk University, Turkey, were allocated to each of 5 different liquid feeding groups (100% whole milk; 75% whole milk + 25% milk replacers; 50% whole milk + 50% milk replacers; 25% whole milk + 75% milk replacers; 100% milk replacers). After the calves were born, they were allowed to suckle their dams and to receive colostrum for 2 days. Then, they were housed in the individual pens which have feeders, milk-water bucket during the experiment. The chemical composition of the milk replacer in the meal form, 2 different calf starters and dried hay are presented in Table1.

The milk replacer was diluted with warm water (50°C) to give about 14% solid content (1 unit milk replacer in 7 unit water). Then, it was cooled to around 35°-36°C before giving to the calves. The whole milk also was warmed to 35°-36°C.

The liquid feed was fed, 10% of birth weight of the calves, by using water-milk bucket once-a-day (Yanar and Tüzemen 1997) for 9 weeks.

Two different calf starter rations were used in this study. Starter 1 was available from birth to 4 months of age and starter 2 was given after 4 months of age. The daily amount of starter offered to the calves was limited to 2 kg/head, but the calves were fed dry hay *ad lib.* during the experiment.

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The body weights, amount of feed consumed by the animals and body measurements such as body length, heart girth, height at withers and chest depth were determined and recorded at birth, weaning, 4 and 6 months of ages (Yanar *et al.* 1993).

The data were analysed statistically by using a 2 × 5 completely randomized factorial experimental design. The ANOVA analysis and Duncan's multiple comparison test was carried out by using SAS statistics package programme (SAS 1986).

The average birth weights (Table 2) in the liquid feeding groups were not statistically significant. The weights determined at weaning (9 weeks of age); 4 and 9 months of ages were not affected significantly by the different liquid feeding treatments. The sex also did not have significant effect on these weights (Table 2).

Whole milk-fed calves gained at a slightly faster rate than milk replacer-fed calves in the pre-weaning period (Table 3). However, the differences among liquid feeding groups were not statistically significant. Similar results were also reported by Leon and Benezra (1990).

The differences among the feeding groups for daily weight gains of the calves between weaning and 4 months of age were not statistically significant. Similar results were also obtained between 4 and 6 months of ages (Table 3). Overall daily weight gains between birth and 6 months of age were also not influenced by liquid feeding treatments. The overall daily weight gains of calves fed whole milk or milk replacer were comparable. The findings were in accordance with

Table 1. Chemical composition of milk replacer, starter rations and dried hay

Nutrients	Milk replacer	Starter I (%)	Starter II (%)	Dried hay (%)
Dry matter	96.5	88.0	88.0	91.5
Protein	24.5	18.0	17.1	6.7
Ether extract	19.0	3.6	2.9	3.2
Ash	9.5	7.0	7.6	10.4
Cellulose	0.5	11.4	11.8	28.2
Carbohydrate	41.5	-	-	-

Table 2. The weights obtained at different ages of Brown Swiss calves

	n	Birth weight $X \pm S_x$	Weaning weight $X \pm S_x$	4 months weight $X \pm S_x$	6 months weight $X \pm S_x$
Liquid feeding groups					
	Significance	NS	NS	NS	NS
% 100 WM	10	35.70±2.25	64.30±3.47	104.00±4.42	138.50±4.20
% 75 WM - % 25 MR	10	37.20±2.25	60.80±3.47	95.90±4.42	132.10±4.20
% 50 WM - % 50 MR	10	35.30±2.25	64.60±3.47	103.40±4.42	139.00±4.20
% 25 WM - % 75 MR	10	37.20±2.25	63.20±3.47	96.70±4.42	134.40±4.20
% 100 MR	10	36.00±2.25	61.70±3.47	100.90±4.42	139.60±4.20
Sex					
	Significance	NS	NS	NS	NS
Male	25	37.52±1.42	64.20±2.19	101.36±2.79	139.76±2.66
Female	25	35.28±1.42	61.64±2.19	99.00±2.79	133.68±2.66
Rations × sex					
Significance	NS	NS	NS	NS	
% 100 WM × male	5	36.20±3.18	64.60±4.91	105.00±6.25	140.80±5.95
% 100 WM × female	5	35.20±3.18	64.00±4.91	103.0±6.25	136.20±5.95
% 75 WM-% 25 MR × male	5	36.00±3.18	54.80±4.91	85.00±6.25	125.40±5.95
% 75 WM-% 25 MR × female	5	38.40±3.18	66.80±4.91	106.80±6.25	138.80±5.95
% 50 WM - % 50 MR × male	5	38.80±3.18	69.20±4.91	110.80±6.25	145.80±5.95
% 50 WM - % 50 MR × female	5	31.80±3.18	60.00±4.91	96.00±6.25	132.20±5.95
% 25 WM - % 75 MR × male	5	39.00±3.18	68.80±4.91	103.60±6.25	143.80±5.95
% 25 WM - % 75 MR × female	5	36.60±3.18	57.60±4.91	89.80±6.25	125.00±5.95
% 100 MR × male	5	37.60±3.18	63.60±4.91	102.40±6.25	143.00±5.95
% 100 MR × female	5	34.40±3.18	59.80±4.91	99.40±6.25	136.20±5.95

MR Milk replacer; WM whole milk; NS nonsignificant; $X \pm S_x$ least-squares mean ± standard error of mean.

Table 3. Weight gains in the various stages of the growth of Brown Swiss calves

		Daily weight gains between			
	n	Birth and weaning $X \pm S_x$	Weaning and 4 months of age $X \pm S_x$	4 and 6 months of ages $X \pm S_x$	Birth and 6 months of ages $X \pm S_x$
(1)	(2)	(3)	(4)	(5)	(6)
Liquid feeding groups					
	Significance	NS	NS	NS	NS
% 100 WM	10	0.453±0.031	0.696±0.039	0.575±0.018	0.570±0.018
% 75 WM - % 25 MR	10	0.374±0.031	0.615±0.039	0.603±0.018	0.527±0.018
% 50 WM - % 50 MR	10	0.465±0.031	0.680±0.039	0.593±0.018	0.576±0.018
% 25 WM - % 75 MR	10	0.413±0.031	0.587±0.039	0.628±0.018	0.536±0.018
% 100 MR.	10	0.408±0.031	0.687±0.039	0.645±0.018	0.564±0.018
Sex					
	Significance	NS	NS	NS	NS
Male	25	0.424±0.019	0.651±0.025	0.640±0.012	0.564±0.012
Female	25	0.418±0.019	0.654±0.025	0.578±0.012	0.546±0.012
Rations × sex					
	Significance	*	*	NS	NS
% 100 WM × male	5	0.450±0.044	0.708±0.055	0.596±0.026	0.581±0.03
% 100 WM × female	5	0.456±0.044	0.683±0.055	0.553±0.026	0.561±0.03
% 75 WM-% 25 MR × male	5	0.297±0.044	0.529±0.055	0.673±0.026	0.496±0.03
% 75 WM-% 25 MR × female	5	0.450±0.044	0.701±0.055	0.533±0.026	0.557±0.03
% 50 WM - % 50 MR × male	5	0.488±0.044	0.729±0.055	0.583±0.026	0.594±0.03
% 50 WM - % 50 MR × female	5	0.447±0.044	0.631±0.055	0.603±0.026	0.557±0.03

Table 3. (Continued)

(1)	(2)	(3)	(4)	(5)	(6)
% 25 WM - % 75 MR × male	5	0.473±0.044	0.609±0.055	0.670±0.026	0.582±0.03
% 25 WM - % 75 MR× female	5	0.333±0.044	0.565±0.055	0.586±0.026	0.491±0.03
% 100 MR ×male	5	0.412±0.044	0.680±0.055	0.676±0.026	0.585±0.03
% 100 MR ×female	5	0.402±0.044	0.694±0.055	0.613±0.026	0.564±0.03

MR Milk replacer; WM whole milk; NS nonsignificant; $X \pm S_x$ least squares mean ± standard error of mean; *P<0.05.

Table 4. Feed efficiency values of the calves

	n	Feed efficiency values			
		Birth and weaning $X \pm S_x$	Weaning and 4 months of age $X \pm S_x$	4 and 6 months of ages $X \pm S_x$	Birth and 6 months of ages $X \pm S_x$
Liquid feeding groups					
	Significance	NS	NS	NS	NS
% 100 WM	10	2.03±0.414	3.02±0.168	4.81±0.258	3.14±0.094
% 75 WM - % 25 MR	10	3.23±0.414	3.18±0.168	4.29±0.258	3.40±0.094
% 50 WM - % 50 MR	10	2.12±0.414	3.19±0.168	4.67±0.258	3.33±0.094
% 25 WM - % 75 MR	10	2.23±0.414	3.27±0.168	4.19±0.258	3.28±0.094
% 100 MR	10	2.65±0.414	3.15±0.168	4.21±0.258	3.41±0.094
Sex					
	Significance	NS	NS	NS	NS
Male	25	2.64±0.262	3.23±0.106	4.23±0.163	3.35±0.059
Female	25	2.31±0.262	3.07±0.106	4.64±0.163	3.28±0.059
Rations × sex					
	Significance	NS	NS	NS	NS
% 100 WM × male	5	1.98±0.586	3.01±0.238	4.50±0.364	3.24±0.133
% 100 WM × female	5	2.07±0.586	3.03±0.238	5.13±0.364	3.03±0.133
% 75 WM-% 25 MR × male	5	4.14±0.586	3.32±0.238	3.66±0.364	3.37±0.133
% 75 WM-% 25 MR × female	5	2.32±0.586	3.04±0.238	4.92±0.364	3.43±0.133
% 50 WM - % 50 MR × male	5	2.20±0.586	3.13±0.238	4.94±0.364	3.57±0.133
% 50 WM - % 50 MR × female	5	2.03±0.586	3.25±0.238	4.40±0.364	3.09±0.133
% 25 WM - % 75 MR × male	5	2.12±0.586	3.35±0.238	4.18±0.364	3.19±0.133
% 25 WM - % 75 MR × female	5	2.59±0.586	3.06±0.238	4.20±0.364	3.37±0.133
% 100 MR × male	5	2.76±0.586	3.31±0.238	3.88±0.364	3.36±0.133
% 100 MR × female	5	2.55±0.586	2.98±0.238	4.53±0.364	3.46±0.133

results of other studies (Chik *et al.* 1986). Daily weight gains of the calves in different ages were also not affected by the sex groups (Table 3).

The feed efficiency values (Table 4) determined at different stages of growth were not significantly influenced by feeding treatments. The results are in agreement with findings of Arora *et al.* (1975). The feeding of calves with milk or milk replacer did not generally have significant influence on the gains of the body measurements between birth and weaning, weaning and 4 months of age, 4 and 6 months of ages. Similar findings were also reported by Mahdy *et al.* (1987).

The overall results of the present study suggest that the whole milk could be replaced by the milk replacer without causing a detrimental effect on the growth and feed efficiency characteristics of the Brown Swiss calves.

REFERENCES

Abou-Hussein E R M, Hanafy M A, El-Talty Y I and Hamouda E H. 1991. Whole milk or milk replacer to calves weaned early or late. *Dairy Science Abstracts* **53** : 757.

Arora S P, Leela Prasad V, Chopra R C and Tomer O S. 1975. Raising calves on milk substitutes. *Indian Journal of Dairy Science* **28** : 140-143.

Chik A B, Hassan W E W, Ismail Z and Haron S. 1986. A comparison of preweaning growth performance of calves fed milk replacer or whole milk. *Nutrition Abstracts and Reviews* (Series B)

56 : 449.

Gampawar A S and Lanore H R. 1984. Milk replacer as a substitute for milk to calves. *Indian Journal of Dairy Science* **37** : 162-64.

Jagos P, Bouda J and Skrivanek M. 1986. Effect of intake of milk replacer and whole milk on the development of some parameters in the blood plasma of calves. *Nutrition Abstracts and Reviews* (Series B) **56** : 110.

Leon R and Benezra M. 1990. Replacement of whole milk by milk substitutes in the rearing Holstein-Friesian calves. *Dairy Science Abstracts* **52** : 373.

Mahdy A E, Ahmed I A and Sharaby M A. 1987. Effect of weaning system on the performance of buffalo and cow calves up to four months of age. *World Review of Animal Production* **23** : 46-49.

Matos L L, De Campos O F, De Pires M, De Leite L and De O. 1986. Comparison between whole milk and various milk replacers for calf feeding. *Nutrition Abstracts and Reviews* (Series B) **56** : 169.

Moran J B, Gaunt G and Sinclair A J. 1988. Growth, carcass and meat quality in veal calves fed diets based on whole milk or milk replacer. *Nutrition Abstracts and Reviews* (Series B) **58** : 717.

Potikanond N and Cheva-Isarakul B. 1984. Feeding of cow's milk and milk replacer in different feeding regimes and their effect on growth and feed consumption of dairy calves. *Thai Journal of Agricultural Science* **17** : 247-56.

SAS. 1986. *SAS Users' Guide, Statistics*. SAS Institute Inc.; Cary, NY, USA.

Yanar M and Tüzemen N. 1997. Esmer buzaðýlarda sütle besleme sýklýðýnýn büyüme ve yemden yararlanma özellikleri üzerine etkileri. *"II. Trakya Bölgesi Hayvancýlýk Sempozyumu"* 9-10 Ocak 1977, Tekirdað.

Yanar M, Tüzemen N and Ockerman H W. 1993. The effect of weaning ages on the growth characteristics and feed efficiencies of simmental calves. *Agriculture and Equipment International* **45** : 38-39.